

Hangar AE



Hangar AE at Cape Canaveral Air Force Station in Florida houses control rooms providing real-time voice, data and video information for expendable launch vehicle checkout and operations. Photo credit: NASA/Dan Casper

Hangar AE, at Cape Canaveral Air Force Station in Florida, provides real-time video, voice and data for vehicle checkout and launch operations, and can be configured to support any of the unmanned launch vehicle fleet. This unique capability of being able to support any rocket simultaneously makes Hangar AE a crucial communication center for NASA's Launch Services Program (LSP).

LSP vehicle engineers use Hangar AE to provide independent verification and validation of the launch vehicle and NASA spacecraft readiness. This separation from the vehicle-specific launch system provides insight into processes and operations of the commercial launch market for managers and engineers for all of NASA's missions.

Built in 1958, Hangar AE originally was designed for the Department of Defense Mace missile program, housing missile components. The facility was acquired by NASA in 1960 from the Air Force and modified as a telemetry station for the U.S. unmanned rocket program and occasionally used during the Space Shuttle Program.

Currently, LSP uses Hangar AE as its communications center and can operate 24 hours a day, seven days a week, 365 days a year. It receives, records,

processes and displays telemetry data signals from pre-launch checkout, through launch, spacecraft separation and orbital insertion. The building contains a Mission Director's Center, three Launch Vehicle Data Centers, a telemetry ground station, offices for payload and contractor personnel and a "class 10K" horizontal clean room complex.

The "10K," or 10,000, clean room designation signifies that there are less than 10,000 particles greater than half-micron in size in any cubic foot of air. This provides an environment in which sensitive spacecraft systems are protected from contaminants.

Mission Director's Center

The Mission Director's Center, or MDC, is LSP's premier control room in Hangar AE. The MDC is designed for senior managers to support ground testing and liftoff of any launch vehicle. In 2017 the MDC will undergo

MDC Quick Facts

- 39 console positions
- Dedicated area for 2 Public Affairs Officers
- Fully configurable voice, video, timing, telemetry and internet services per console
- 3 high-definition (HD) cameras
- 32-foot mission video wall



From their consoles in the Mission Director's Center, managers and engineers monitor a launch vehicle and spacecraft prior to liftoff. On Dec. 15, 2016, members of the launch team monitor the progress of preparations to launch eight Cyclone Global Navigation Satellite System, or CYGNSS, spacecraft with a Pegasus XL rocket. Photo credit: NASA/Kim Shiflett

a major upgrade to provide 34-inch ultrahigh-definition monitors allowing senior managers to see video, voice and data all on one screen. With the modular design of the systems, the MDC can support missions at both Cape Canaveral Air Force Station on the East Coast and Vandenberg Air Force Base on the West Coast.

Launch Vehicle Data Center

The Launch Vehicle Data Center, or LVDC, is LSP's world-class, multipurpose control room. The LVDC was developed to support multiple operations in parallel or a single launch and consists of three rooms. In 2016, the LVDCs underwent a major renovation to provide up to four 34-inch, ultrahigh-definition monitors with a side touchscreen voice instrument for heavy data users.

Each console in the LVDC has a multichannel voice instrument called a Mission Operation Communication System, or MOCS3. MOCS3 provides viewing of 40 voice nets simultaneously. These voice nets are connected to all NASA centers,



In the Hangar AE's Launch Vehicle Data Center, NASA and contractor managers and engineers monitor progress of the countdown and liftoff of rockets that boost payloads to Earth orbit and beyond. Photo credit: NASA/Cory Huston

commercial launch providers, customer mission operation centers and the U.S. Air Force.

The video system can have up to 256 high-definition video signals from around the Cape, including commercial launch providers, spacecraft processing facilities and tracking cameras. Of those 256 video signals, each console can display up to eight unique, customizable size-and-location video windows. Each LVDC also has a 16-by-9 foot mission video wall.

Each console has access to the processed telemetry data through two computer programs. WinPlot allows for the comparison of real-time versus archived data plotted on a graph while Iris allows users to build their own display pages with a number of different widgets, or web applications. These widgets can display numeric engineering units, graphs or just green/red indicators. Since it is scalable and portable, Iris can securely display data to any user, anywhere around the world.

Telemetry Lab

The Telemetry Lab, or TMLAB, is designed to process the ground and airborne telemetry streams of any launch vehicle. The TMLAB can process every sample and measurement of 12 simultaneous data streams. Ground testing is conducted through AE's fixed antennas and other antennas around Cape Canaveral. The TMLAB can provide concurrent telemetry streams while analyzing data and best source selecting from one to many launch vehicles. Additionally, TMLAB maintains an online archive of launch vehicle telemetry stretching back over 15 years.

When Iris is combined with the TMLAB's connectivity to NASA, the U.S. Air Force, commercial sites and networks downrange, LSP can support any vehicle, any time and at any location around the world.



During expendable rocket countdowns, launch vehicle telemetry is monitored from a console in the Telemetry Laboratory in Hangar AE. Photo credit: NASA/Dan Casper

Historic Timeline

1956



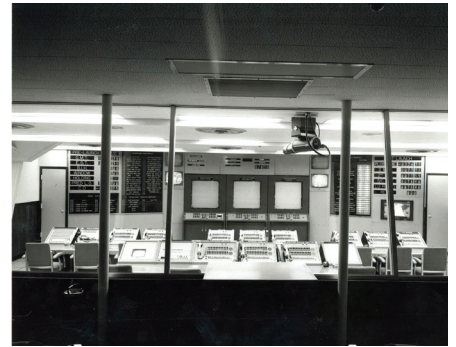
During 1956, prior to construction of Hangar AE, the Vanguard project was intended to be self-contained to the maximum extent possible. Its telemetry stations were located in trailers at the T-Pad, Hangar C, and later, Hangar S. Photo credit: U.S. Air Force

1960



When the Vanguard project concluded, NASA took responsibility for supporting the Thor launch vehicle which was later renamed Delta. Support was provided from Hangar H and additional trailers. Photo credit: NASA

1963



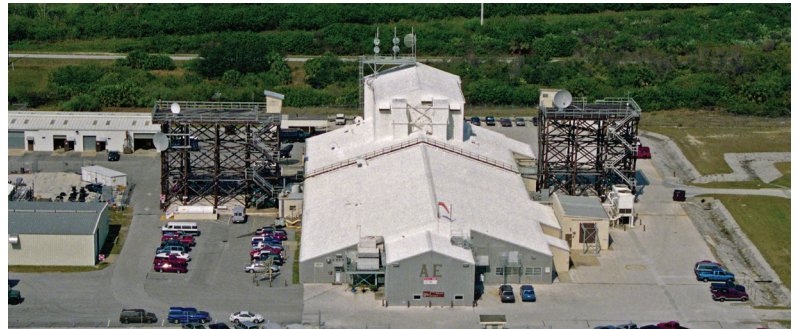
The expendable launch vehicle data station moved out of trailers into Hangar AE establishing both the Mission Director Center and the Launch Vehicle Data Center. Photo credit: NASA

1967



A view of the Telemetry Laboratory in February 1967. The lab is designed to process the ground and airborne telemetry streams from any launch vehicle in the U.S. fleet and also has supported numerous spacecraft. Photo credit: NASA

1998



In 1998, Launch Services Program is born and NASA's Kennedy Space Center is responsible for agency oversight of launch operations and countdown management. A multiyear project began to upgrade the telemetry processing and voice switching systems in Hangar AE. Photo credit: NASA

Historic Launches



On Aug. 20, 1975, Hangar AE supported the launch of the Viking 1 Mars lander. All Titan/Centaur operations were the responsibility of the Kennedy Space Center's Unmanned Launch Operations Directorate, a predecessor of the current Launch Services Program. Photo credit: NASA



A Boeing Delta II rocket propels Deep Space 1 through the morning clouds at liftoff from Launch Complex 17A at Cape Canaveral Air Force Station on Oct. 24, 1998. It is the NASA Launch Services Program's first official launch. Photo credit: NASA

The NASA Launch Services Program team supports operations as far away as the U.S. Army's Ronald Reagan Ballistic Missile Defense Test Site on Kwajalein Atoll in the Marshall Islands. In October 2008, the L1011 carrier aircraft, Stargazer, launched a Pegasus XL rocket with the Interstellar Boundary Explorer from the site in the Pacific Ocean. Photo credit: NASA



NASA's New Horizons spacecraft roars off Cape Canaveral's Launch Complex 41 atop an Atlas V rocket on Jan. 19, 2006, for its journey to Pluto. New Horizons was the fastest spacecraft ever launched, passing through the moon's orbit in just nine hours. The flight path will allow New Horizons to fly past Jupiter in early 2007 and use the planet's gravity as a slingshot toward Pluto arriving in 2015. Photo credit: NASA

Ongoing Support



In the Hangar AE Launch Vehicle Data Center, NASA and contractor managers and engineers monitor countdown progress for launch of eight Cyclone Global Navigation Satellite System, or CYGNSS, spacecraft aboard a Pegasus XL rocket on Dec. 15, 2016. Photo credit: NASA/Kim Shiflett

SpaceX



From Hangar AE the Launch Services Program at NASA's Kennedy Space Center provided independent monitoring of SpaceX's Falcon 9 launch vehicle. LSP continues to work with SpaceX for independent processing of telemetry data. Photo credit: NASA/Tony Gray

Commercial and other DoD support



Launch Services Program continues to support commercial reimbursable missions by providing support for telemetry and other requested services from Hangar AE. A United Launch Alliance Atlas V rocket lifts off from Space Launch Complex 41 at Cape Canaveral Air Force Station with a Cygnus spacecraft. It delivered 7,600 pounds of supplies, equipment and scientific research materials to the International Space Station. Photo credit: NASA/Tony Gray and Sandra Joseph

To view the latest Kennedy Space Center fact sheets, go to <http://go.nasa.gov/11KR0r6>.

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